WHAT IS CLAIMED IS:

1. A collector for illumination systems with a wavelength of ≤ 193 nm, preferably ≤ 126 nm, particularly preferred, EUV wavelengths with

1.1 an object-side aperture, which collects light emitted from a light source (1),

1.2 a plurality of rotationally symmetrical mirror shells (40, 42, 44, 46, 60, 62, 64, 66, 68, 70, 72, 74, 78, 80, 200, 202, 204, 205, 206, 207, 208, 209), which are arranged in one another around a common axis of rotation, wherein a ring aperture section (20, 22, 24, 210, 212, 214) of the object-side aperture is assigned to each mirror shell, and

1.3 an area in a plane (7) which is to be illuminated and which comprises of planar ring sections (30, 32, 34, 230, 232, 234), wherein a ring aperture section (20, 22, 24, 210, 212, 214) is assigned to each planar ring section (30, 32, 34, 230, 232, 234)

characterized in that

1.4 the ring aperture sections (20, 22, 24, 210, 212, 214) do not overlap

1.5 the planar ring sections (30, 32, 34, 230, 232, 234) do not overlap and almost continuously fit together in plane (7) and

1.6 the dimensions in the direction of the axis of rotation, the surface parameters and the positions of mirror shells (40, 42, 44, 46, 60, 62, 64, 66, 68, 70, 72, 74, 78, 80, 200, 202, 204, 205, 206, 207, 208, 209) are selected such that the irradiances of the individual planar ring sections (30, 32, 34, 230, 232, 234) are almost the same for the most part in plane (7).

2. The collector according to claim 1, further characterized in that the dimensions of mirror shells (40, 42, 44, 46, 60, 62, 64, 66, 68, 70, 72, 74, 78, 80) are different in the direction of the axis of rotation.

3. The collector according to one of claims 1 to 3, further characterized in that the mean value of the initial and end points of a mirror shell (40, 42, 44, 46, 60, 62, 64, 66, 68, 70, 72, 74, 78, 80, 200, 202, 204, 205, 206, 207, 208, 209) with regard to the axis of rotation indicate the position of a mirror shell and that the position of an outer mirror shell is further distant from plane (7) than the position of an inner mirror shell.

4. The collector according to one of claims 1 to 3, further characterized in that the quotient of a first ratio of the radial dimension of a planar ring section to the angular extension of the assigned ring aperture section and a second ratio of the radial dimension of a second planar ring section to the angular extent of the assigned ring aperture section is substantially equal to the quotient of a first radiant intensity, which is reduced by the loss of reflectivity of a first mirror shell, which flows into the first ring aperture section, and of a second radiant intensity, which is reduced by the loss of reflectivity of a second mirror shell, which flows into the second ring aperture section.

5. The collector according to one of claims 1 to 4, further characterized in that light source (1) isotropically irradiates light and a first ratio of the radial dimension of a first planar ring section to the angular extent of the assigned ring aperture section is substantially equal to the second ratio of the radial dimension of a second planar ring section to the angular extent of the assigned ring aperture section.

6. The collector according to claims 1 to 5, further characterized in that the radial dimensions of at least two planar ring sections (30, 32, 34) are of equal size and the dimension in the direction of the axis of rotation of the mirror shell (40, 60) assigned to the inner planar ring section (30) is larger than the dimension in the direction of the axis of rotation of the mirror shell (42, 62) assigned to the outer planar ring section (32).

7. The collector according to one of claims 1 to 6, further characterized in that mirror shells (40, 42, 44, 46, 60, 62, 64, 66, 68, 70, 72, 74, 78, 80) represent ring-shaped segments of aspherical objects.

8. The collector according to claim 7, further characterized in that mirror shells (40, 42, 44, 46, 60, 62, 64, 66, 68, 70, 72, 74, 78, 80) are a ring-shaped segment of an ellipsoid or a paraboloid or a hyperboloid.

9. The collector according to one of claims 1 to 5, further characterized in that at least one mirror shell (200, 202, 204, 205, 206, 207, 208, 209) comprises a first segment (200.1, 202.1, 204.1) with a first optical surface (200.2, 202.2, 204.4) and a second segment (200.3, 202.3, 204.3) with a second optical surface (200.4, 202.4, 204.4).

10. The collector according to claim 9, further characterized in that the first ring-shaped segment (200.1, 202.1, 204.1) is a segment cut out from a hyperboloid and the second ring-shaped segment (200.3, 202.3, 204.3) is cut out from an ellipsoid.

11. The collector according to claim 9, further characterized in that the first ring-shaped segment (200.1, 202.1, 204.1) is a segment cut out from a hyperboloid and the second ring-shaped segment (200.3, 202.3, 204.3) is a segment cut out from a paraboloid.

12. The collector according to one of claims 1 to 11, further characterized in that at least two adjacent ring aperture sections are not continuously fit together.

13. The collector according to one of claims 1 to 12, further characterized in that the innermost ring aperture section of collector (3) has a central aperture obscuration and the numerical aperture NA_{min} of the aperture obscuration amounts

to a maximum of 0.30, preferably a maximum of 0.20, particularly preferred, a maximum of 0.15, and most particularly preferred, a maximum of 0.1.

14. The collector according to claim 13, further characterized in that a diaphragm (180) is arranged inside the innermost ring aperture section of collector (3).

15. The collector according to one of claims 1 to 14, further characterized in that the object-side aperture has a numerical aperture NA_{max} of at least 0.4, preferably at least 0.5 and, particularly preferred, at least 0.7.

16. The collector according to one of claims 1 to 15, further characterized in that the collector has at least three, preferably more than six, particularly preferred, more than ten mirror shells.

17. The collector according to one of claims 1 to 16, further characterized in that the rays of the beam bundle exiting from light source (1) impinge with angles of incidence of less than 20° to the surface tangent of mirror shells (40, 42, 44, 46, 60, 62, 64, 66, 68, 70, 72, 74, 78, 80, 200, 202, 204, 205, 206, 207, 208, 209).

18. An illumination system for wavelengths of ≤ 193 nm, particularly < 126 nm, particularly preferred in the EUV range with

18.1 a light source (1),

18.2 at least one collector (3)

18.3 of a plane (7, 103) to be illuminated,

characterized in that

18.4 the collector is a collector (3) according to one of claims 1 to 18.

19. The illumination system for wavelengths of ≤ 193 nm, particularly < 126 nm, particularly preferred, in the EUV range, according to claim 18, further

characterized in that the illumination system also has a first optical element 102, containing first grid elements 150.

20. The illumination system for wavelengths of ≤ 193 nm, particularly < 126 nm, particularly preferred, in the EUV range, according to one of claims 18 or 19, further characterized in that the collector (3) illuminates a ring-shaped region in the plane (7, 103) to be illuminated and that the first grid elements (150) of the first optical element (102), which is arranged in plane (7, 103) to be illuminated, are arranged approximately within the ring-shaped region.

21. The illumination system for wavelengths of ≤ 193 nm, particularly < 126 nm, particularly preferred, in the EUV range, according to claim 19 or 20, further characterized in that the illumination system also contains optical elements (106, 108, 110) for imaging and/or field shaping.

22. The illumination system for wavelengths of ≤ 193 nm, particularly < 126 nm, particularly preferred, in the EUV range, according to one of claims 19 to 21, further characterized in that the illumination system has a plane conjugated to light source (1) between collector (3) and plane (103) to be illuminated, in which an intermediate image (Z) of light source (1) is formed.

23. The illumination system for wavelengths of ≤ 193 nm, particularly < 126 nm, particularly preferred, in the EUV range, according to one of claims 19 to 23, further characterized in that a diaphragm (202) is arranged in or near the intermediate image (Z), and this diaphragm separates the space containing at least light source (1) and collector (3), spatially and/or pressure-wise, from the downstream illumination system.

24. An EUV projection exposure system with
24.1 an illumination system according to one of claims 19 to 23,
24.2 a mask, which is illuminated by the illumination system,

24.3 a projection objective (126) for imagining the mask on

23.4 a light-sensitive object.

25. A process for the production of microelectronic components, particularly semiconductor components with an EUV projection exposure system according to claim 24.

Add A1

Add B2